Jet Resolution with Different Magnetic End Doors

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fsphenix/EIC meeting

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Fun4All Setup

- Currently only running 100 events

- This takes about 30 minutes

- The code I use to generate on the right

- Line 163 shows Pi- particles

- Line 180 shows 30 GeV particles

```
159         // toss low multiplicity dummy events
160         PHG4SimpleEventGenerator *gen = new PHG4SimpleEventGenerator();
161         //gen->add_particles("e-",5); // mu+,e+,proton,pi+,Upsilon
162         //gen->add_particles("e+",5); // mu-,e-,anti_proton,pi-
163         gen->add_particles("pi-",1); // mu-,e-,anti_proton,pi-
164         if (readhepmc) {
165     gen->set_reuse_existing_vertex(true);
166     gen->set_existing_vertex_offset_vector(0.0,0.0,0.0);
167         } else {
168     gen->set_vertex_distribution_function(PHG4SimpleEventGenerator::Uniform,
169                     PHG4SimpleEventGenerator::Uniform,
170                     PHG4SimpleEventGenerator::Uniform);
171     gen->set_vertex_distribution_mean(0.0,0.0,0.0);
172     gen->set_vertex_distribution_width(0.0,0.0,5.0);
173         }
174         gen->set_vertex_size_function(PHG4SimpleEventGenerator::Uniform);
175         gen->set_vertex_size_parameters(0.0,0.0);
176         gen->set_eta_range(2, 2.0);
177         //gen->set_eta_range(3.0, 3.0); //fsPHENIX FWD
178         gen->set_phi_range(-1.0*TMath::Pi(), 1.0*TMath::Pi());
179         //gen->set_phi_range(TMath::Pi()/2-0.1, TMath::Pi()/2-0.1);
180         gen->set_p_range(30.0, 30.0);
181         gen->Embed(1);
182         gen->Verbosity(0);
183         se->registerSubsystem(gen);
184     }
```

fsPHENIX setup

- The parameters for the Magnetic End Door

- SetLength modifies Thickness

- SetRadius modifies inner radius

- Value of SetThickness is outer radius minus inner radius

- Other parameters seem self-explanatory

- I change both the flux return plus and minus

```
192
193    if ( do_FHCAL )
194        FHCALSetup(g4Reco, absorberactive);
195
196    // sPHENIX forward flux return(s)
197    PHG4CylinderSubsystem *flux_return_plus = new PHG4CylinderSubsystem("FWDFLUXRET", 0);
198    flux_return_plus->SetLength(10.2);
199    flux_return_plus->SetPosition(0,0,335.9);
200    flux_return_plus->SetRadius(2.1);
201    flux_return_plus->SetLengthViaRapidityCoverage(false);
202    flux_return_plus->SetThickness(263.5-5.0);
203    flux_return_plus->SetMaterial("G4_Fe");
204    flux_return_plus->SetActive(false);
205    flux_return_plus->SuperDetector("FLUXRET_ETA_PLUS");
206    flux_return_plus->OverlapCheck(overlapcheck);
207    g4Reco->registerSubsystem(flux_return_plus);
208
209    PHG4CylinderSubsystem *flux_return_minus = new PHG4CylinderSubsystem("FWDFLUXRET", 0);
210    flux_return_minus->SetLength(10.2);
211    flux_return_minus->SetPosition(0,0,-335.9);
212    flux_return_minus->SetRadius(2.1);
213    flux_return_minus->SetLengthViaRapidityCoverage(false);
214    flux_return_minus->SetThickness(263.5-5.0);
215    flux_return_minus->SetMaterial("G4_Fe");
216    flux_return_minus->SetActive(false);
217    flux_return_minus->SuperDetector("FLUXRET_ETA_MINUS");
218    flux_return_minus->OverlapCheck(overlapcheck);
219    g4Reco->registerSubsystem(flux_return_minus);
220
```

Work so Far

- Changing the thickness of the material and running simulations
- Started by testing limits (i.e. when does it break)
- 1000 cm highest tested value that gave no results
- 100 cm still gave something
- 1 μm gave interesting results
- Also looked at half, double, and a quarter of the default value (10.2cm)
- Haven't changed the other parameters yet but will do so as needed

The 1000 cm Plot

- Empty as expected

- Clearly much larger than anything that is needed
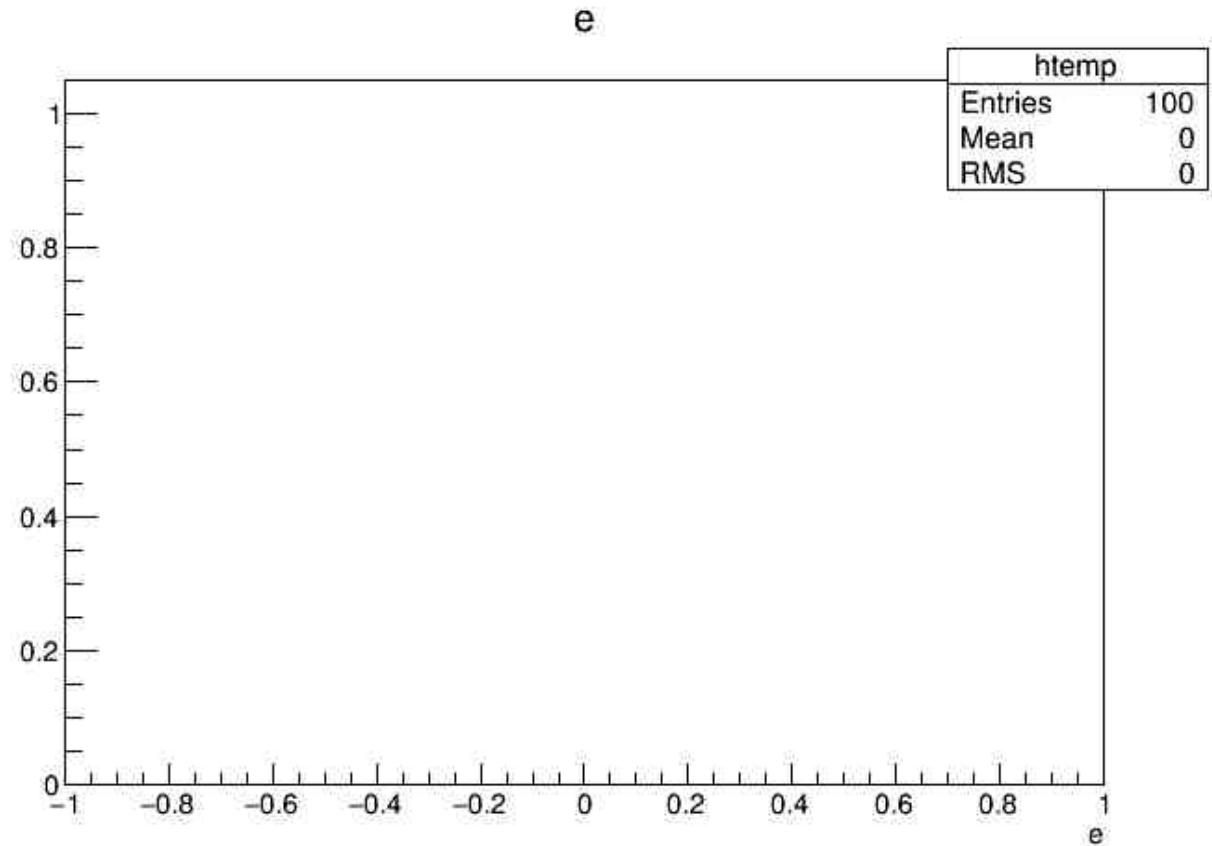
1 μm Plot

- Even though magnetic door is a micron thick the plot still shows loss of energy

- This energy seems to be about 5 GeV

- This energy loss seems a little too high for a micron thick plate

- Possible Issues could be I am looking at wrong thing or not enough events
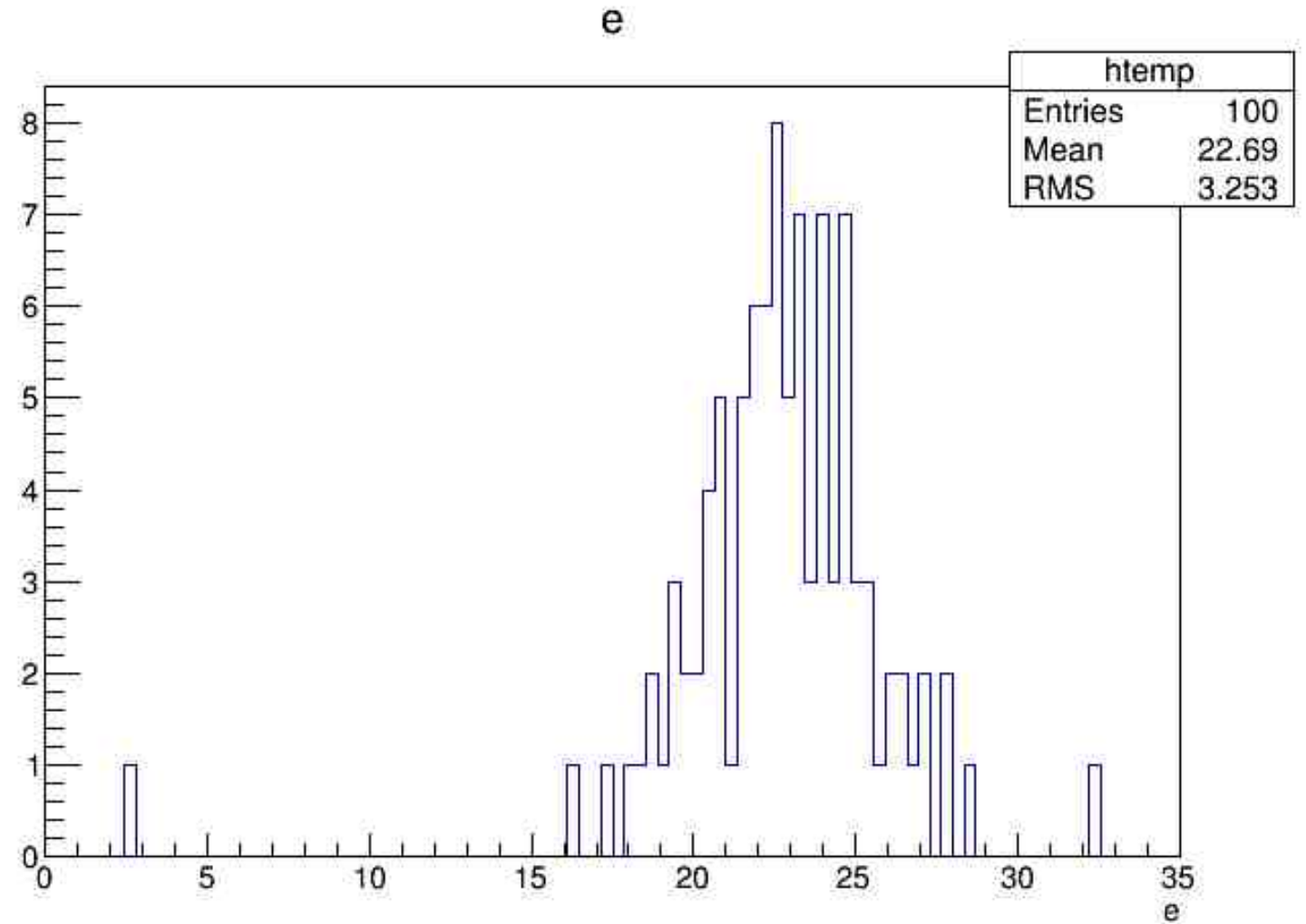
- Suggestions are welcome
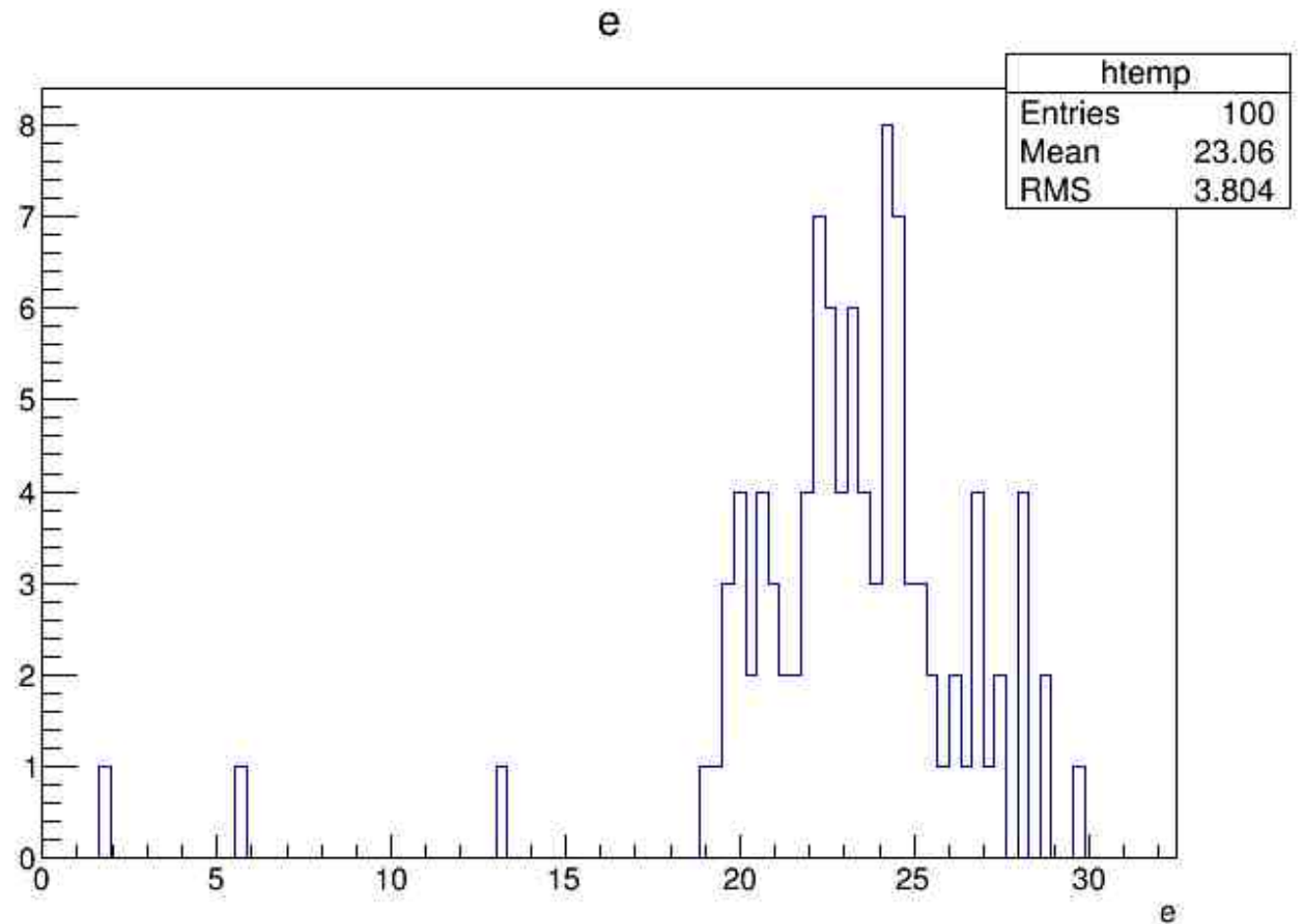
10.2 cm (Default) Plot

- Hard to see a clear average
- Merely to demonstrate that there is some energy loss
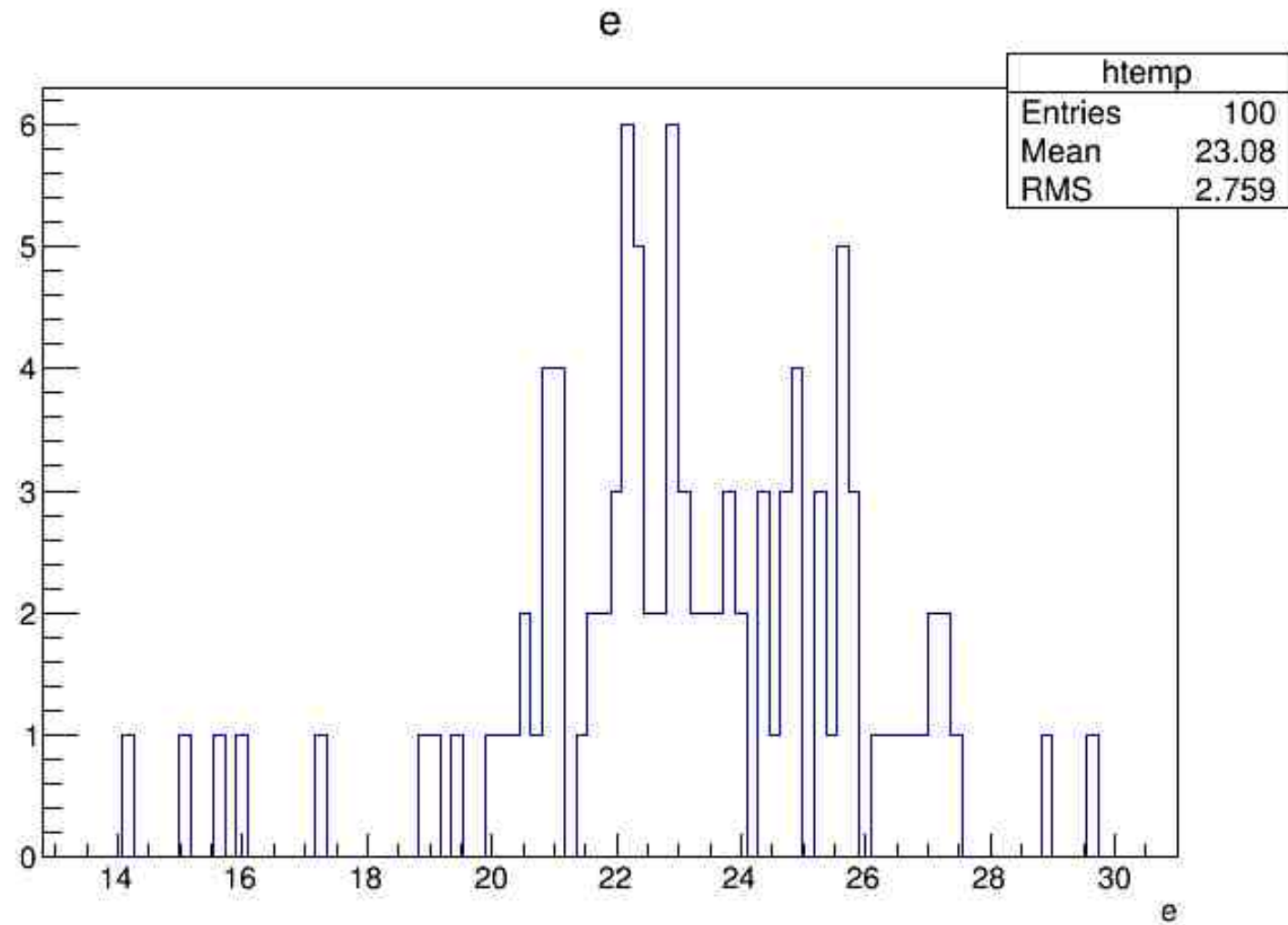- Need more events to see a pattern
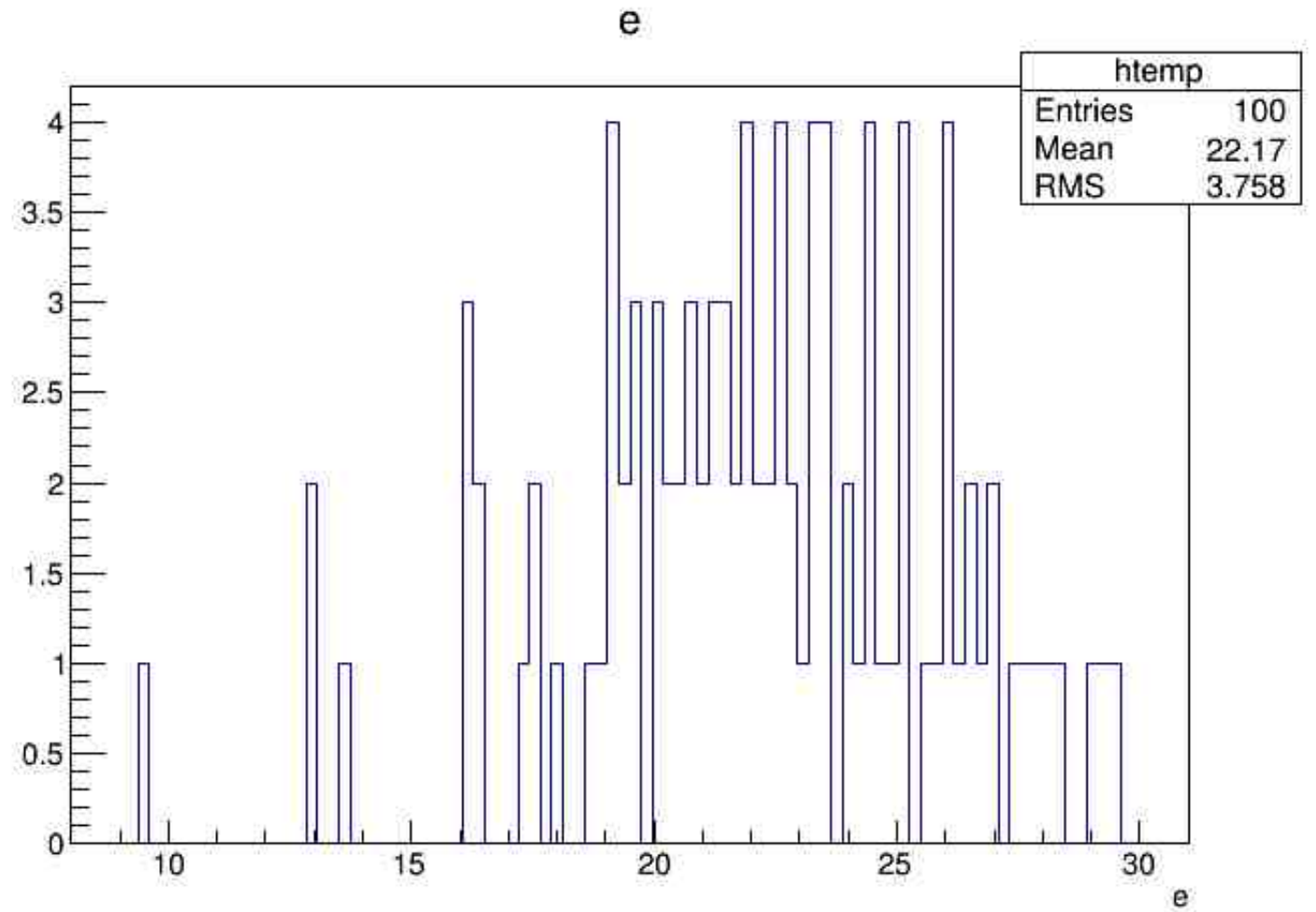
5.1 cm (Half) Plot

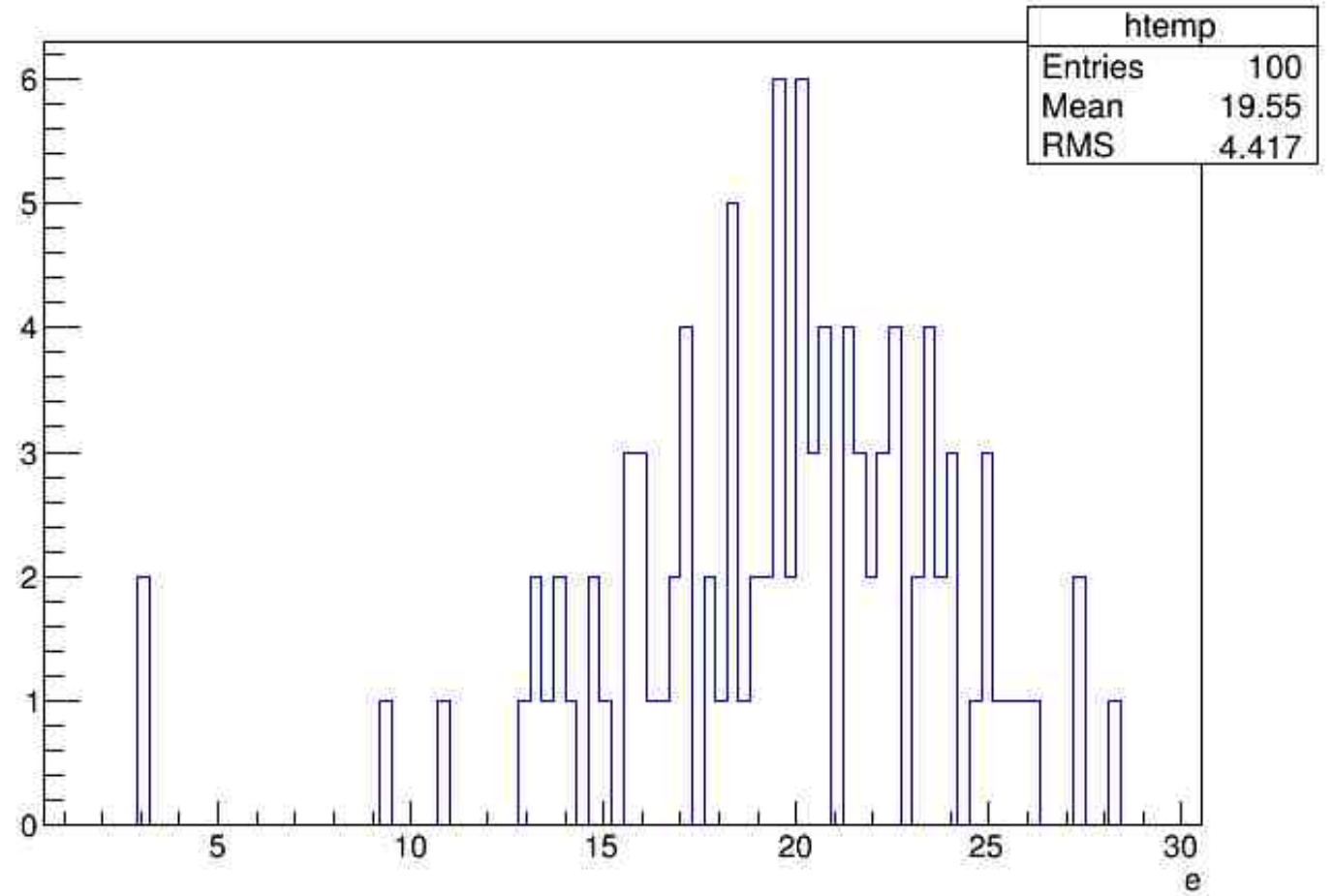- A peak can be seen around 23 GeV

- Need more events to confirm

2.55 cm (Quarter) Plot
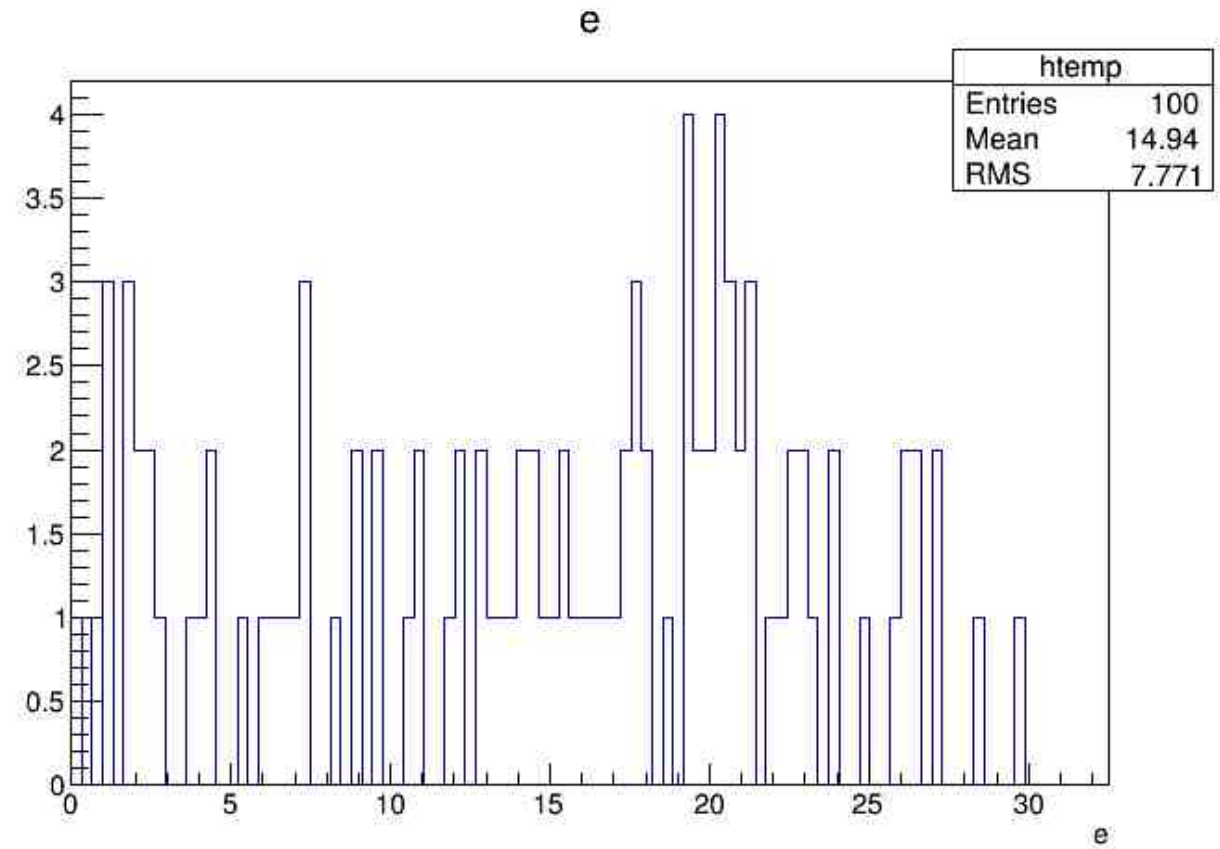
- No discernable peak due to lack of events

20.4 cm (Double) Plot

- There may be a peak around 20 GeV

- Again need more events to confirm

100 cm Plot

- No clear peak due to lack of events

Conclusions and Future Plans

- The average energies seem to be lower but more events is needed to make this conclusive
- Thin doors show significant energy loss, which could indicate some other issue is at play
- Use condor to generate more events
- Change radii, thickness, and materials to see different effects
- Any other comments or suggestions will be greatly appreciated